



Contents lists available at ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol



Why do patents facilitate trade in technology? Testing the disclosure and appropriation effects

Gaétan de Rassenfosse^a, Alfons Palangkaraya^b, Elizabeth Webster^{b,*}

^a College of Management of Technology, École Polytechnique Fédérale de Lausanne, Switzerland

^b Centre for Transformative Innovation, Swinburne University of Technology, Australia

ARTICLE INFO

Article history:

Received 24 February 2014

Accepted 18 March 2016

Available online xxx

Keywords:

Appropriability

Disclosure

Licensing

Market for technology

Patent

ABSTRACT

Evidence suggests that patents facilitate technology transactions but the reasons for the effect are unclear. Patents may assist trade in technology by either: (i) protecting buyers against the expropriation of the idea (the ‘appropriation effect’); or (ii) increasing information sharing during the negotiation phase through publication of technical details contained in the patent document (the ‘disclosure effect’). We estimate the strength of both effects using exact matching analysis on a novel dataset of 860 technology transaction negotiations. We find evidence for the appropriation but not the disclosure effect. Technology transaction negotiations involving a granted patent instead of a pending patent (our test for the appropriation effect) are significantly more likely to be successfully completed. The appropriation effect is stronger in technology fields where patent protection is known to be more effective such as biotech, chemicals, drugs and medical.

© 2016 Elsevier B.V. All rights reserved.

1. Introduction

This paper studies the mechanisms through which intellectual property (IP) rights affect the success of negotiations to trade technology. Trade in technology has become a central part of today’s highly-specialized and opened innovation process (Arora et al., 2001; Chesbrough 2003). Data from the United States (US) National Science Foundation, for example, show that the ratio of US business research and development (R&D) contracted out to external enterprises trebled between 1981 and 2007 from about two per cent to seven per cent (NSB, 2008). Technology trade improves welfare as it allows for the emergence of specialized inventors, which increases the innovation quality, speeds up development time, and enhances knowledge diffusion (Lamoreaux and Sokoloff 2001; Spulber 2008). However, as in the case of tangible goods, the realization of welfare gains from technology trade rests upon well-functioning markets.

Several authors have argued and provided evidence that markets for technology suffer from imperfections, often leading to transaction failures (Caves et al., 1983; Zeckhauser 1996; Arora et al., 2001; Gans and Stern 2010; Zhang et al., 2013). Imperfections include, but are not limited to, high search costs and other transaction costs, lack of market thickness, and incomplete infor-

mation (and related concerns about information asymmetry such as in a market for lemons). Although the literature provides ample evidence that patents assist technology transactions (Lamoreaux and Sokoloff 2001; Arora and Ceccagnoli 2006; Branstetter et al., 2006; Gans et al., 2008), there is still a need for a better understanding of how patents help innovative firms and technology traders in overcoming frictions in the market for technology. There is little empirical evidence that can explain the mechanisms through which patents facilitate technology trade.

In this paper, we empirically investigate the relative importance of two reasons why patents are helpful in technology market. As Gans et al., (2008; 987) observe “...patent rights can have a significant impact on the *risk of expropriation* and the willingness of licensors to *disclose* unprotected information” (italics added). The former part of the statement means that patents facilitate technology trade by protecting the buyer against expropriation. In this ‘traditional’ role of patents, possession of a valid patent may help assure the prospective buyer that his or her future profits will be protected. We refer to this reason as the ‘appropriation effect’ hypothesis. On the other hand, the latter part of the statement implies that patents facilitate technology trade by increasing information sharing during the negotiation phase since pending patent applications are published 18 months after the filing date. We refer to this reason as the ‘disclosure effect’ hypothesis.

To the best of our knowledge, existing studies on markets for technology have not provided any formal empirical

* Corresponding author.

E-mail address: emwebster@swin.edu.au (E. Webster).

examination of these hypotheses. Most studies have so far sought to provide evidence that patents matter, without seeking to disentangle the actual mechanisms through which patents operate. Yet understanding the mechanisms would shed light on the causes of transaction failures and would help in proposing appropriate policy responses to market imperfections. From the perspective of our research question, a limitation of the existing studies is the absence of information to predict the relevant counterfactuals for estimating the two effects: they either focus only on patented technologies or on technologies that will ultimately become licensed (Shane, 2002; Elfenbein, 2007; Gans et al., 2008). Two recent studies by Hedge and Luo (2013) and Drivas et al. (2013) provide some insights on part of the mechanism: they find that patent disclosure accelerates the licensing of technologies by reducing search costs.

A key distinguishing feature of the present study is that it uses a novel survey data of technology transaction negotiations in which *not all* negotiations involve a patent, and *not all* negotiations are successful. The setup allows us to construct counterfactuals to estimate the importance of the two hypothesized roles of patents. In addition, it enables us to obtain estimates of patent effects that do not suffer from the sample bias in existing studies that only consider patented technologies. The analysis relies on a sample of 860 immature technology transactions—sale, license, cross-license, contract research, etc.—negotiated in Australia around the 2010s. A first noteworthy finding is that 20.3 per cent of technology transaction negotiations in the sample do not involve a patent. Second, we find that the positive patent effect comes mostly from limiting expropriation of the technology (and more so in technology fields where patents are effective). The evidence in support of the disclosure effect is less apparent.

2. Literature review and hypotheses

2.1. Existing studies

A first set of studies that are relevant to the focus of this paper offers indirect evidence of the importance of patents in markets for technology. Lamoreaux and Sokoloff (2001) argue that the changes in the US patent law in the nineteenth century were instrumental in the development of a market for technology. Burhop (2010) documents a well-developed market for patents in Imperial Germany. Using more recent data, Branstetter et al. (2006) show that technology transfer within US multinational firms increases in response to a strengthening of intellectual property (IP) rights in host countries. Arora and Ceccagnoli (2006) find that an increase in the effectiveness of patent protection can increase licensing propensity. Another stream of research has surveyed the motives to patent and provides additional evidence on the importance of patents in technology transactions (Cohen et al., 2000; Blind et al., 2006; de Rassenfosse 2012; Jensen et al., 2015). These surveys of patenting firms typically report that between 20 and 30 per cent of respondents take patents in order to generate licensing revenues.

More direct evidence on the role of patents in technology transactions is scarcer. Drawing on data on 1397 patents assigned to Massachusetts Institute of Technology, Shane (2002) studies among other questions, the determinants of patent licensing. He finds that inventions are more likely to be licensed when patents are an effective mechanism for appropriating the returns to innovation. Using a sample of technologies invented by faculty at Harvard University, Elfenbein (2007) studies the factors that affect the likelihood of an invention being licensed. He finds that, although a majority of technologies are licensed prior to the receipt of a patent, a patent more than doubles the likelihood of finding a license partner. Gans et al. (2008) study how the IP system impacts the timing of cooperation between start-up technology entrepreneurs

and established firms during commercialization. Based on a sample of 200 technology-licensing deals announced in 1990–1999 they find that patent allowance speeds up licensing. The grant event is associated with a 70 per cent increase in the hazard rate of licensing. Other authors have recently produced additional evidence on the effect of patents on the *timing* of licensing agreements. Hedge and Luo (2013) and Drivas et al. (2013) use the enactment of the American Inventors Protection Act of 1999, which requires patent applications to be published 18 months after the priority filing date, to show that patent disclosure accelerates the licensing of technologies. Hedge and Luo (2013) take this result as evidence that patents reduce search cost in the market for ideas.

2.2. Hypotheses

Although the above studies provide evidence of the impact of patents, they were not designed to explain the reason(s) for the effect. This is because their samples had a different focus: some samples focus on patented technologies only, while others focus only on technologies that will ultimately become licensed. As a result these studies provide limited insight on the extent to which, and the reason(s) why, patents increase the success rate of technology transactions. In a nutshell, this paper empirically investigates how patents facilitate technology trade: by insulating the idea against expropriation (appropriation effect); and by increasing the sharing of information during the negotiation phase by disclosing technical details of the idea (disclosure effect). The first effect arises because a granted patent gives its owner the right to exclude others from using the ideas embodied in the patent document. The second effect occurs because, by law, patent applications are made public 18 months after application. Thus, there is no reason for the seller to withhold any relevant technical information that would have become public anyway.

2.2.1. Appropriation effect

Hypothesis 1. Patents facilitate technology trade by strengthening the appropriability of the invention.

Because inventions are typically non-excludable (or at least weakly excludable), buyers may rely on patent protection to ensure exclusive use of their inventions. Traditionally, the patent system ensures excludability by granting the owner of an invention the temporary monopoly right over its invention.

However, in practice, the effectiveness of patents in enhancing appropriation varies significantly across technology fields (Mansfield, 1986; Levin et al., 1987; Cohen et al., 2000). In particular, patent protection is more critical in technologies based on more codified knowledge, which are easier to imitate and are more exposed to third-party expropriation (Teece 1986). These include the chemical and drug-related technologies in which patent validity is easier to assess and infringement is easier to detect (Levin et al., 1987). Hence, we may expect the appropriation effect to be stronger in such fields of technology. By contrast, patent effectiveness is lower in complex technologies, which rely more on hard-to-articulate tacit knowledge beyond the codified description of technology in the patent document. Summarizing existing studies, Troy and Werle (2008) argue that patent documents do not provide tacit knowledge on the context of the technology creation, relevant technical data and complicated formulas, and complementary know-how of the patentee. In addition, patents in these

Download English Version:

<https://daneshyari.com/en/article/10482885>

Download Persian Version:

<https://daneshyari.com/article/10482885>

[Daneshyari.com](https://daneshyari.com)